1st International Workshop on Mechanical Engineering Design of Synchrotron Radiation Equipment and Instrumentation (MEDSI2000)
July 13/14 2000 – Paul Scherrer Institute, Wurenlingen/Villigen, Switzerland

Performance of the Vibration Damping Pads in the APS Storage Ring

D. Mangra[a], S. Sharma[b] and C. Doose[b]

[a]Spallation Neutron Source, Oak Ridge National Laboratory, TN, 37830
Phone: (865) 241-3348
e-mail: iuq@ornl.gov
[b]Advanced Photon Source, Argonne National Laboratory, Argonne, IL 60439, USA
Phone: (630) 252-6820, Fax: (630) 252-5948
e-mail: sharma@aps.anl.gov

Abstract

Beam stability goals for the APS storage ring require that its quadrupoles' vibrations be limited to 110 nm (rms, 4-50 Hz). Viscoelastic damping pads were installed under the girders in order to bring down the vibration levels to within the specified range. This paper presents the design of the damping pads and the results of recent vibration tests to evaluate their performance.

Keywords: Vibration Damping, Damping Pads, Viscoelastic, Storage Ring

1. Introduction

High brilliance of the third generation of light sources requires exceptional beam stability in the storage rings. Important factors that affect the beam stability have been identified as power supply jitters, electronic drifts, temperature fluctuations in the ring, and ground and flow-induced vibrations.

The particle beam in the APS storage ring is required to be stable to within 5% of its rms size [1]. Vibration induced beam motion is assigned 15% of the beam stability budget. This results in a vibration specification for the storage ring magnets, namely, rms horizontal displacement of the quadrupoles is to be less than 110 nm in 4-50 Hz frequency range. Vibration measurements on as-built girder-magnet assemblies showed that the measured motion exceeded this specification by a factor greater than 2. Viscoelastic damping pads were subsequently installed [2,3] to reduce the vibration levels.

Vibration tests are ongoing at the APS to monitor the performance of the installed damping pads, to study other damping schemes to further reduce the vibration levels, and to develop practical guidelines for designing girder supports with damping pads. The results of recent tests are discussed in this paper.

2. Viscoelastic Damping Pads for the APS Girders

The APS storage ring is 1104 m in circumference and consists of 200 girder-magnet assemblies arranged in 40 identical sectors. One of the girder-magnet assemblies with three quadrupoles, one sextupole and two corrector magnets, is shown in Fig. 1. The assembly weighing approximately 14,000 lb is supported on three wedge jacks used for